INDOOR AIR QUALITY ASSESSMENT

Plymouth Senior Center
44 Nook Road
Plymouth, Massachusetts

Prepared by:
Massachusetts Department of Public Health
Bureau of Environmental Health
Indoor Air Quality Program
March 2017

Background

Building:	Plymouth Senior Center (PSC)
Address:	44 Nook Road, Plymouth, MA
Assessment Requested by:	Derek Brindisi, Assistant Town Manager, Plymouth
Reason for Request:	General indoor air quality (IAQ) assessment, respiratory issues.
Date of Assessment:	January 9, 2017
Massachusetts Department of Public Health/Bureau of Environmental Health (MDPH/BEH) Staff Conducting Assessment:	Cory Holmes, Environmental Analyst/Inspector, IAQ Program
Building Description:	The building was newly constructed and opened in 2012. It has a main floor, with common areas, office space, veterans' service area, activity rooms and a finished basement.
Building Population:	The space occupied by approximately 10 employees and 20 volunteers. Members of the public visit daily.
Windows:	Openable

Methods

Please refer to the IAQ Manual and appendices for methods, sampling procedures, and interpretation of results (MDPH, 2015).

Results and Discussion

The following is a summary of indoor air testing results (Table 1).

- ***Carbon dioxide*** measurements were below the MDPH recommended level of 800 parts per million (ppm) in all but one area surveyed.
- ***Temperature*** was within the MDPH recommended range of 70°F to 78°F in all areas tested at the time of assessment.
- ***Relative humidity*** was below the MDPH recommended range of 40 to 60% in all areas tested.
- ***Carbon monoxide*** levels were non-detectable in all areas tested.

- ***Particulate matter (PM2.5)*** concentrations measured were below the National Ambient Air Quality (NAAQS) level of 35 $\mu g/m^3$ in all areas tested.

Ventilation

A heating, ventilating and air-conditioning (HVAC) system has several functions. First it provides heating and, if equipped, cooling. Second, it is a source of fresh air. Finally, an HVAC system will dilute and remove normally occurring indoor environmental pollutants by not only introducing fresh air, but also filtering the airstream and ejecting stale air to the outdoors via exhaust ventilation. The system at the PSC facility is computerized and controlled offsite by a third-party HVAC control firm.

Test results suggest that sufficient fresh air is being introduced into the space for the current occupancy. The one exception was the break room, which had 8 occupants at the time of testing. In addition, the outdoor temperature was below 32°F at the time of assessment, which may have limited outside air intake to prevent freezing/damage of heating coils.

It is important to note that relative humidity levels in the building would be expected to be low during the winter months due to atmospheric conditions and heating. Low relative humidity can lead to common symptoms such as: dry skin, lips, and scalp; dry/scratchy throats and noses (nose bleeds); exacerbation of asthma, eczema, or allergies; dry/irritated eyes; and irritation of respiratory tract.

In order to have proper ventilation with a mechanical HVAC system, the system must be balanced to provide an adequate amount of fresh air to the interior of a room while removing stale air from the room. It is recommended that existing ventilation systems be re-balanced every five years to ensure adequate air systems function (SMACNA, 1994). The date of the last balancing of the HVAC system would have occurred prior to occupancy in 2012.

The rooftop air handling units (AHUs) were not accessible at the time of assessment. It is recommended that AHUs should be outfitted with pleated filters of a Minimum Efficiency Reporting Value (MERV) of 8, which are adequate in filtering out pollen and mold spores (ASHRAE, 2012). In addition, filters should be changed 2-4 times a year or in accordance with the manufacture's recommendations.

Microbial/Moisture Concerns

In order for building materials to support mold growth, a source of water exposure is necessary. The building had issues with water-damaged building materials due to condensation/insufficient insulation around pipes several years ago. The areas were damaged by these conditions were repaired and no damage in the previously-affected areas was observed at the time of assessment. In addition, no further damage was reported over the previous summer, when buildings are typically prone to condensation due to elevated humidity. One water-damaged ceiling tile was observed in the main lobby (~40 feet up). This is most likely due to a previous leak, as no current leaks were reported.

The US Environmental Protection Agency (US EPA) and the American Conference of Governmental Industrial Hygienists (ACGIH) recommends that porous materials (e.g., wallboard, carpeting, ceiling tiles) be dried with fans and heating within 24 to 48 hours of becoming wet (US EPA, 2008; ACGIH, 1989). If porous materials are not dried within this time frame, mold growth may occur. Once mold has colonized porous materials, they are difficult to clean and should be removed.

Other Conditions

In a few areas, items were observed on the floor, windowsills, tabletops, counters, bookcases and desks. The large number of items stored provides a source for dusts to accumulate. These items (e.g., papers, folders, boxes) make it difficult for custodial staff to clean. Items should be relocated and/or be cleaned periodically to avoid excessive dust build up.

Personal fans, supply and exhaust vents were found to be dusty in some areas. Regular cleaning of supply diffusers, exhaust vents and personal fans will reduce aerosolizing any accumulated particulate matter on these surfaces.

Many of the areas contain wall to wall carpeting. Carpets should be cleaned annually (or semi-annually in soiled/high traffic areas) in accordance with Institute of Inspection, Cleaning and Restoration Certification (IICRC) recommendations, (IICRC, 2012).

Conclusions and Recommendations

In view of the findings at the time of the visit, the following recommendations are made:

1. Operate HVAC system in fan “on” mode (vs. “auto”) to provide continuous circulation/filtration during occupied hours.
2. Have the HVAC system re-balanced, as recommended (every 5 years) in accordance with SMACNA recommendations (SMACNA, 1994).
3. Ensure filters for rooftop AHUs are of a pleated variety, MERV dust-spot efficiency 8 or higher, which are adequate in filtering out pollen and mold spores (ASHRAE, 2012). Filters should be changed 2-4 times a year or in accordance with the manufacture’s recommendations.
4. For buildings in New England, periods of low relative humidity during the winter are often unavoidable. Therefore, scrupulous cleaning practices should be adopted to minimize common indoor air contaminants whose irritant effects can be enhanced when the relative humidity is low. To control for dusts, a high efficiency particulate arrestance (HEPA) filter equipped vacuum cleaner in conjunction with wet wiping of all surfaces is recommended. Avoid the use of feather dusters. Drinking water during the day can help ease some symptoms associated with a dry environment (throat and sinus irritations).
5. Continue to monitor areas over the summer/during the cooling season for condensation/insulation issues. If issues reoccur, work with facilities/building management to identify areas of leaks/sources of water damage (e.g., condensation issues above ceiling tiles) for repair/corrective actions.
6. Reduce accumulated materials on flat surfaces and move periodically to allow for thorough cleaning.
7. Regularly clean supply diffusers, exhaust vents and personal fans to avoid re-aerosolizing any accumulated debris.
8. Clean carpeting annually or semi-annually in soiled high traffic areas as per the recommendations of the Institute of Inspection, Cleaning and Restoration Certification (IICRC, 2012). Copies of the IICRC fact sheet can be downloaded at: http://www.iicrc.org/consumers/care/carpet-cleaning.
9. Refer to resource manual and other related IAQ documents located on the MDPH’s website for further building-wide evaluations and advice on maintaining public buildings. These documents are available at http://mass.gov/dph/iaq.

REFERENCES

ACGIH. 1989. Guidelines for the Assessment of Bioaerosols in the Indoor Environment. American Conference of Governmental Industrial Hygienists, Cincinnati, OH.

ASHRAE. 2012. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) Standard 52.2-2012 -- Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size (ANSI Approved). 2012.

IICRC. 2012. Carpet Cleaning FAQ 4 Institute of Inspection, Cleaning and Restoration Certification. Institute of Inspection Cleaning and Restoration, Vancouver, WA.

MDPH. 2015. Massachusetts Department of Public Health. Indoor Air Quality Manual: Chapters I-III. Available at: http://www.mass.gov/eohhs/gov/departments/dph/programs/environmental-health/exposure-topics/iaq/iaq-manual/.

SMACNA. 1994. HVAC Systems Commissioning Manual. 1st ed. Sheet Metal and Air Conditioning Contractors' National Association, Inc., Chantilly, VA

US EPA. 2008. Mold Remediation in Schools and Commercial Buildings. US Environmental Protection Agency, Office of Air and Radiation, Indoor Environments Division, Washington, D.C. EPA 402-K-01-001. September 2008. Available at: http://www.epa.gov/mold/mold-remediation-schools-and-commercial-buildings-guide.

Location: Plymouth Senior Center

Address: 44 Nook Road, Plymouth, MA

Indoor Air Results

Date: 1/9/2017

Table 1

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m^3)	Occupants in Room	Windows Openable	Ventilation		Remarks
								Intake	Exhaust	
Background	429	ND	<32	18	16					Clear and cold
006	456	ND	74	7	5	0	Y	Y	Y	
Lower Level Activity Room	475	ND	75	7	5	0	Y	Y	Y	
102	623	ND	73	9	5	8	Y	Y	Y	
113 Art	618	ND	74	9	8	5	Y	Y	Y	Vented kiln, DO
114	591	ND	74	8	5	1	Y	Y	Y	DO, dry erase materials
115	532	ND	73	7	5	2	Y	Y	Y	DO, dry erase materials
119	780	ND	78	10	5	3	N	Y	Y	Dry erase materials, DO
122	625	ND	78	8	5	0	Y	Y	Y	DO
123	610	ND	78	8	5	0	Y	Y	Y	DO
126	1075	ND	78	8	14	8	Y	Y	Y	DO, dry erase materials
128	673	ND	75	11	6	0	N	Y	Y	

ppm = parts per million DO = door open µg/m^3= micrograms per cubic meter ND = non-detect

Comfort Guidelines

Carbon Dioxide: < 800 ppm = preferred
> 800 ppm = indicative of ventilation problems

Temperature: 70 - 78 °F
Relative Humidity: 40 - 60%

Location: Plymouth Senior Center **Indoor Air Results**

Address: 44 Nook Road, Plymouth, MA **Date: 1/9/2017**

Table 1 (continued)

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m^3)	Occupants in Room	Windows Openable	Ventilation		Remarks
								Intake	Exhaust	
129	729	ND	76	9	7	3	Y	Y	Y	
132	703	ND	72	8	5	0	Y	Y	Y	DO
134	763	ND	76	13	16	1	Y	Y	Y	DO
137	571	ND	77	8	6	0	N	Y	Y	DO
144	545	ND	72	7	6	0	Y	Y	Y	DO
145	534	ND	78	7	5	0	Y	Y	Y	DO
Admin Service Area	553	ND	78	7	5	0	Y	Y	Y	
146	512	ND	76	7	5	7	Y	Y	Y	DO
Main Lobby	588	ND	76	8	5	7	Y	Y	Y	1 water-damaged ceiling tile
Veterans' Service Reception	593	ND	76	8	5	1	Y	Y	Y	
Activities	704	ND	76	9	5	1	Y	Y	Y	Group just left

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